Remarks

Applicants have made changes in the specification to clarify the background art discussion and the summary of the invention and to provide improved conformity of the summary of the invention and the particular description of the invention.

Paragraph 22 of the particular description has been amended to eliminate a typographical error. The word "to" has been replaced by the word – do –.

Dependent claims 9 and 10 are added to recite the countershaft gears, which are part of the geared transmission set forth in their respective base claims.

Claim 11, which is a generic claim that defines the embodiments of Figures 2 and 3, has been added. This added claim complements claims 1, 4, 6 and 7, which define the embodiment of Figure 2, and claims 2, 3, 5 and 8, which define the embodiment of Figure 3.

Claims 1-8 are rejected under 35 U.S.C. § 102(b) as being anticipated by reference patent 5,887,670. Applicants believe that the claims, as presently amended, are patentably distinguishable from the '670 patent for the reasons set forth in the following paragraphs.

The present invention is a hybrid electric vehicle powertrain with improved reverse gear performance, unlike the powertrain illustrated, for example, in Figure 1 of Applicants' drawings. The powertrain of Applicants' present invention, as illustrated in Figures 2 and 3, will remove a reaction element, which is the ring gear 48 in the embodiment of Figures 2 and 3, from the torque delivery path during reverse drive. Applicants' invention uses the motor to establish reverse drive. The planetary gearing, the engine and the generator of the powertrain shown in Figure 1 are not capable of providing reverse torque delivery.

When the motor is used during reverse drive, the battery can be charged by the generator as the engine drives the generator through the planetary gearing 46. The ring gear 48 at that time acts as a reaction element because it is anchored by the brake 60. The clutch 62 is released at that time, which interrupts the geared torque flow path between the motor and the generator. With the ring gear 48 acting as a reaction point, the engine can drive the generator to charge the battery when the motor is operating in a reverse drive mode. The battery can be charged when the state-of-charge of the battery is low. This permits the

generator to supply electric power to the motor during reverse drive and excess power generated by the generator can be stored in the battery. During operation in this reverse drive mode, it is not necessary for the motor to overcome reaction torque on the ring gear, as in the case of the design of Figure 1. Further, if the generator is used as a starter motor to start the engine, the brake 60 in Figure 2 can be applied as carrier cranking torque is distributed to the engine crankshaft.

Claims 2, 3, 5 and 8 define the alternate embodiment of Figure 3 wherein a first clutch 88 and a second clutch 90 are arranged in the torque flow path from the carrier 52′ and the ring gear 48′, respectively.

Reference patent '670 does not disclose structure that is capable of carrying out the functions recited in structural terms in claims 1-8 as they now are amended. It is impossible to read the limitations in claims 1-8 on the disclosure of the '670 patent. Although the '670 patent discloses a planetary gear unit in combination with an engine 12 and a generator 14, there is no counterpart for Applicants' recited reaction brake for anchoring the ring gear of the planetary gear unit. Neither is there a clutch between the ring gear and the torque output element 26. Neither is there a clutch for isolating the reaction element of the reverse torque flow path during reverse drive.

The reaction element in the case of Applicants' design is the ring gear 48 in Figure 2. Thus, the motor in Applicants' design is relieved of the burden of overcoming the reaction torque for the generator when the generator is used during reverse drive to crank the engine. The motor is not required to supply reaction torque to the generator during reverse drive or during engine cranking. Instead, the reaction brake 60 of Applicants' design of Figure 2 supplies the reaction torque for the generator during reverse drive and during engine cranking. This concept is entirely unrelated to the teachings of the '670 patent.

In the case of the embodiment of Figure 3 of Applicants' drawings, the clutch 88 will lock-up the planetary gearing when it is engaged. This in effect isolates the torque flow path through the planetary gearset from the torque flow path for the motor and the countershaft gearing. The engine then is directly connected through the locked-up planetary gearing to the generator. When clutch 88 is disengaged and clutch 90 is engaged, the powertrain will function in a manner similar to the powertrain shown in Figure 1.

In both Figures 2 and 3 of Applicants' drawings, a motor is disclosed. The motor is drivably connected directly to the traction wheels. There is no counterpart in the powertrain of the '670 patent for Applicants' motor. It is not possible to compare the '670 patent disclosure to Applicants' claimed construction where a motor in a hybrid electric vehicle powertrain is isolated from the planetary gearing. The single motor-generator 14 of the powertrain of the '670 patent is not equivalent to Applicants' separate motor 74/74′ and generator 40/40′.

In view of the substantial differences between the teaching of the '670 patent and the claimed structure of Applicants' claims, it is impossible to make a patentability analysis using an element-by-element comparison of Applicants' claim structure with the structure disclosed in the '670 patent reference.

It is respectfully requested that a Notice of Allowance be issued.

Respectfully submitted,
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